Global Value Chains, Contract Manufacturers, and the Middle Income Trap: The electronics industry in Malaysia

Journal:	*Journal of Development Studies*
Manuscript ID	FJDS-2017-Feb-0093.R2
Manuscript Type:	Papers in Special Issues
Keywords:	middle-income trap, global value chain, electronics industry, Malaysia, upgrading, contract manufacturers

Global Value Chains, Contract Manufacturers, and the Middle Income Trap: The electronics industry in Malaysia

ABSTRACT

The electronics industry has been a cornerstone to the successful industrialisation process in Malaysia since the 1970s. However, since the 2000s the industry which is deeply integrated in global value chains has failed to upgrade. Its stagnation is indicative of the general economic situation in Malaysia which has contributed to its middle-income trap. This paper argues two key factors combined have led to the electronics industry's inability to upgrade within the global value chain. First is Malaysia's excessive reliance on foreign investment which has contributed to a prolonged dominance of foreign firms, particularly large transnational contract manufacturers, which have maintained low-value-added production in the country. Second is the influx of low-skilled and low-waged foreign workers which has contributed to trapping the industry in labour-intensive lower rungs of the value chain.

Keywords: middle-income trap, global value chain, upgrading, electronics, Malaysia

1. Introduction

According to Spence (2011, p. 100), how countries transition out of the middle-income status is by replacing low-wage, labour intensive industries – which helped a country reach the middle-income status but subsequently became less competitive due to rising wages – with "a new set of industries that are more capital-, human capital-, and knowledge-intensive in the way they create value". This paper contributes to this debate on why this has *not* occurred in the case of Malaysia, which has fallen into a middle-income trap since the mid-1990s. The paper does so with an examination of the electronics industry -- a significant pillar of the manufacturing sector and contributor to overall economic growth in Malaysia – and its inability to upgrade within the global value chain (GVC) since the 2000s (Felipe, 2012). The inability of the industry to upgrade into higher value-added and knowledge intensive processes is indicative of wider challenges faced by the manufacturing industry in Malaysia. Rasiah, Crinis, & Lee (2015) characterised the situation as 'negative deindustrialisation' – that is the inability of a diminishing manufacturing sector to be replaced by a higher value-added services sector during stages of economic development. Factors

contributing to this phenomenon include reduced contribution of manufacturing to GDP, slowdown in the electronics industry which has been a driver for manufacturing growth historically, and a reduced comparative advantage in export-oriented manufacturing. Evidence for negative industrialisation is seen through the decline in value-added growth and falling manufacturing labour productivity (including in the electronics industry) since the mid-1990s (see Table 1) (Rasiah, 2011; Rasiah et al., 2015).

Table 1. Electrical machinery and electronics. Value-added growth (% per year), 1979-2010

1979-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
8.0	16.4	26.8	12.1	0.5	1.3

Source: Rasiah et al. (2015)

Using a GVC perspective, this paper argues two key factors have contributed to the stagnation of the electronics industry in lower value-added segments of the value chain. First is Malaysia's excessive reliance on foreign investment which has contributed to a prolonged dominance of foreign firms, particularly large transnational contract manufacturers, which have maintained low-value-added production in the country. Second is the influx of low-skilled and low-waged foreign workers supported by government policies. Malaysia's historical and deep integration of the electronics industry in segments of the GVC dominated by large foreign firms in lower value-added and labour-intensive segments have not only been shaped by government industrialisation policies but also structural and reorganizational changes within the GVC which this paper focuses on.

The paper discusses these factors with an examination of recent dynamics in the electronics industry GVC and how it relates to the rise and dominance of contract manufacturing in Malaysia. Contract manufacturers have increased their organisational powers in the GVC including determining the geographical reorganisation of various production activities worldwide. To date, contract manufacturers are the largest employers in the electronics industry GVC and have some of their largest factories located in Malaysia (Azmeh, Nadvi, & Raj-Reichert, 2014; Raj-Reichert, 2018; Sturgeon & Kawakami, 2011). Thus, a discussion of their operations in the country in recent years helps to show how a deep integration of a middle-income country in a GVC does not always lead to upgrading outcomes.

This paper is based on primary and secondary research. Primary data was gathered through interviews conducted with three large contract manufacturers in Malaysia, Singapore, China, and their headquarter locations in North America and Western Europe in 2008, 2013, and 2015. Respondents were managers, directors, and vice presidents of corporate social responsibility, human resources, and health and safety departments. Many of the respondents, particularly those in senior positions, had began their positions with responsibilities over production and manufacturing operations, business management and development, and as commodity buyers. The majority also held degrees in Business Administration and Management. Thus, they were knowledgeable about the business and sustainability decisions and challenges faced by their firms. Many respondents had also worked in competitor firms. Their knowledge through various experiences and over many years in the industry were harnessed in interviews to understand changing dynamics in the electronics industry globally and in Malaysia over time. Interviews with government agencies and government officials in Malaysia were conducted in 2008 and 2015. Secondary research is based on a literature review, SEC company filings, industry and firm reports, and reports from government agencies in Malaysia.

The paper continues with section two on a discussion of the literature on the middle-income trap and how it relates to GVCs and processes of upgrading. This is followed by section three on the historical development of the electronics industry in Malaysia and how three distinct stumbling blocks to future upgrading were instituted within industrialisation policies in pursuit of foreign investment and export-led economic growth. It is followed by section four with an analysis of the two key factors which have contributed to the persistent stagnation of the electronics industry in lower rungs of the GVC: 1) changing structure and reorganisation of the electronics industry GVC whereby contract manufacturers have increasingly become more powerful players in restructuring and reorganisation processes; and 2) large inflow of low-skilled low-waged foreign migrant workers in the electronics industry which have sustained non-upgrading business strategies by contract manufacturers in Malaysia. Section five concludes the paper.

2. Middle-income traps, global value chains, and upgrading

As more countries enter and persist in a middle-income trap (Felipe, 2012), debates on how to escape it has increased in recent years (Doner & Schneider, 2016; Ohno, 2009; Paus,

2012). At the state level, policy recommendations include innovation to catch-up to high-income countries. There are prerequisites for high-quality tertiary education, government investments for research and development (R&D) and undertaking difficult structural changes to rid of old firms and old technologies (Hill, Yean, & Zin, 2012). More recently Doner and Schneider (2016) discussed the difficulties middle-income countries face with implementing upgrading policies (such as technology development, vocational training, and R&D) without the necessary institutions including business-government coalitions. They note, "the conditions that facilitated or accompanied the earlier ascension to middle-income status, such as foreign investment, low-skilled and low-paid work, inequality, and informality, over time generated cleavages that impeded subsequent upgrading policies and building the institutions necessary to implement them" (Doner & Schneider, 2016, pp. 610-611). The authors point to various political obstacles present in middle-income countries to the creation of such institutions. These obstacles include differences in interests between foreign and domestic firms which can prevent coalition building that are necessary for supporting upgrading policies.

These challenges can be exacerbated in the global contexts of GVCs. Paus (2012) sets out the difficulties for upgrading within GVCs as the following. Middle-income countries are stuck between a rock and a hard place unable to compete with low-wage countries while at the same time not having yet developed the skills and knowledge necessary for higher value-added production and services. The need to build human capital through skills development and education to overcome the middle-income trap is clear. However, it is precisely in middle-income countries dominated by foreign firms which tends to lack public interest and political will for the betterment of education beyond the secondary level (Doner & Schneider, 2016). Countries which surpassed middle-income status such as South Korea and Taiwan in contrast had large domestic business support for improvements in education to meet demands for a highly skilled workforce. In an era of vast GVCs, however, deeply integrated developing countries dominated by foreign firms can lack the necessary private sector support to host governments when it is not in their interest to do so. Domination by foreign firms in a country can also crowd out large domestic firms necessary for advocating policies in favour of national development priorities such as educational upgrading (Doner & Schneider, 2016).

These concerns get at the heart of the debates around upgrading within GVCs and the role of foreign versus domestic firms in kick-starting the process (Paus, 2012; Pietrobelli & Rabellotti, 2011). In GVCs economic upgrading is the process by which a firm enters a new phase of producing higher value-added products or services that afford it higher prices, revenues, and/or profit. Much of the early literature on upgrading in GVCs is focused on buyer-supplier relationships. The concept of upgrading in GVCs were determined largely by the degree of governance by and power of lead firms over suppliers. In GVCs where lead firms have some degree of mutual dependence with competent and capable suppliers the former have been supportive of certain types of upgrading through processes of learning and knowledge transfer albeit limited to activities which do not encroach on competitive and proprietary processes such as design, patented products, and technologies (Staritz, Gereffi, & Cattaneo, 2011).

Suppliers can also achieve upgrading from compliance with product standards such as technology and quality standards and process standards such as quality management systems, labour, and environmental standards (Humphrey & Schmitz, 2002). However, standards compliance can be costly for smaller suppliers. Evidence, including in the electronics industry, show some domestic suppliers choosing economic 'downgrading' as business strategies to avoid competition with foreign branded firms (Barrientos, Gereffi, & Rossi, 2011). Where upgrading has occurred in the electronics industry GVC it has tended to be limited to foreign firms in the host country without meaningful backward linkages to domestic suppliers (Carillo & Zarate, 2009; Plank & Staritz, 2013; Sturgeon & Kawakami, 2011).

While the GVC literature is clear on the powerful role played by lead firms in upgrading processes (see Gereffi, Humphrey, & Sturgeon, 2005), the rise of large first tier suppliers however has challenged the ideas that lead firms are the main drivers of GVCs. Large transnational first-tier suppliers increasingly shape the organisation, geographies, as well as higher value-added processes such as design, technology, and innovation developments in GVCs such as electronics and apparel. As a result of continued supplier consolidations by branded firms over time, large transnational suppliers, such as Foxconn and Flex in electronics or Li and Fung and Yuen Yuen Industrial in apparel, today command their own vast global supply chains. These large transnational suppliers are as a result lead firms on their own right in buyer-supplier relationships with a large number of suppliers with

influence over their upgrading opportunities in various host countries (Azmeh et al., 2014; Raj-Reichert, 2018).

A more recent example of these changes in the electronics industry GVC is seen with a small group of large first-tier suppliers called contract manufacturers. Contract manufacturers conduct and organise the vast majority of outsourced production for branded firms. According to the European Commission (2012), branded firms outsourced up to 80% of their production to five contract manufacturers: Flex, Jabil Circuit, Celestica, Sanmina-SCI, and Foxconn (see Table 2).

Table 2. Top five contract manufacturers in the electronics industry

Firms	HQ	Manufacturing Locations	Revenue (USD Million, 2015)	Employees
Foxconn	Taiwan	Mainland China, Vietnam, India, Indonesia, Brazil, Japan, Malaysia, Mexico, South Korea, United States, European countries	136,122.773	1.3 million (2015)
Flex[i]	United States /Singapore[ii]	Mainland China, Japan, Taiwan, Malaysia, India, Indonesia, Singapore, Philippines, United States, Mexico, Canada, Brazil, Israel, European countries,	26,147.92	200,000 (2016)
Jabil Circuit	United States	Mainland China, Taiwan, Singapore, Brazil, Malaysia, Israel, United States, European countries	17.899.20	More than 175,000 (2015)
Sanmina-SCI	United States	Canada, Mexico, United States, Argentina, Brazil, Colombia, European countries, Israel, South Africa, India, Indonesia, Malaysia, Singapore, Thailand, China, Japan, Australia	6,374.54	33,144 (2014)
Celestica	Canada	China, Japan, Thailand, United States, Canada, Mexico, European countries,	5,639.20	25,000 (2015)

Sources: https://markets.ft.com/; company websites

From their origins as relatively low value-added manufacturing suppliers, contract manufacturers have upgraded into higher value-added segments in the past decade. They have taken over more supply chain responsibilities from branded firms and grown in size and increasingly moved into design and innovation in conjunction with maturing co-dependent relationships with their lead firms. As a result of major supplier consolidations and increased shedding of supply chain management responsibility by lead firms contract manufacturers themselves outsource manufacturing and parts and components from a vast group of second tier suppliers (Azmeh et al., 2014; Nadvi and Raj-Reichert, 2015; Raj-Reichert, 2015; Raj-

Reichert, 2018). This has led to contract manufacturers commanding the largest global supply chains in the industry (Sturgeon & Kawakami, 2011). As a result, contract manufacturers have emerged as powerful players in the shaping, restructuring and organisation of GVCs and their geographies of production. This is important in discussions of upgrading in developing countries due to their large and prolonged presence in host countries. Where these large suppliers choose to upgrade can have significant effects on domestic upgrading trajectories in developing countries.

Coming back to the discussion on upgrading as a way out of the middle-income trap, there is a substantial literature discussing the role of governments in capturing the benefits and spill-overs from the presence of foreign firms, for example through favourable business and entrepreneurial environments, obligations of technology transfer, skill building, and fostering innovation and linkages between MNCs and local research institutes, universities, or through science parks (Hobday, 1994). These discussions must necessarily be linked up to questions of firm decisions and behaviours in dynamic and evolving GVCs and where MNCs choose to upgrade their activities and for what reasons (Edgington & Hayter, 2013). Further GVCs are in a process of continual change in response to changing competitive pressures, business cycles, as well as economic crises at the global scale (Gereffi, 2014). This makes it necessary to update our understanding or 'keep up' with the fast-pace changes of GVCs over time and their impacts on host countries.

3. A history of stumbling blocks to the path of upgrading in the electronics industry in Malaysia

The electronics industry was a pillar of the industrialisation process and economic growth in Malaysia after gaining independence in 1957. Till today, the industry is a major contributor to employment and GDP growth for the country (see Table 3). It continues to contribute more to employment and GDP than any other industrial sector in the country. In 2014, the industry[iii] made up 33.4% of all Malaysian exports and 23.7% of all employment. The industry was also the leading recipient of FDI in 2014 (Malaysian Investment Development Authority, 2016). During the 1980s and into the mid-1990s the industry experienced an upgrading trajectory seen with a positive growth in manufacturing value-added. However, since the 2000s the industry has failed to upgrade. The industry remains relatively low-value-added, low-waged, low in labour productivity, and labour-intensive (see Tables 4 and 5 and Figure 1) (Luethje, Huertgen, Pawlicki, & Sproll, 2013; Phillips &

Henderson, 2009; Rasiah et al., 2015). This section presents three 'stumbling blocks', which are a combination of federal government policies and external factors, within the country's historical industrialisation process which it is argued in hindsight have contributed to the inability of the electronics industry to upgrade.

Table 3. Manufacture of electronic valves and tubes and other electronic components. Gross output and employment, RM in Billion, percentage share, and rank, 2005 – 2009, 2012

	2005	2006	2007	2008	2009	2012
Total RM in Billion	84.9	92.8	87.8	84.2	75.2	83.3[iv]
% Share to Total Gross Output and Rank	12.9% (no.1)	13.1% (no. 2)	11.8% (no.3)	10.3% (no. 3)	10.3% (no. 3)	9.2% (no.3)
Employment	193,142	204,509	177,175	189,532	183,579	199,238
Share of Total Employment and Rank	11.5% (no. 1)	11.9% (no. 1)	9.8% (no. 1)	10.7% (no. 1)	10.8% (no. 1)	12% (no. 1)

Sources: Statistics Malaysia (2005-2009, 2012)

The electronics industry was developed with the luring of foreign companies to establish offshored factories in free trade zones (FTZs) in the country. This began in the late 1960s when Malaysia's industrialisation policies diversified the economy away from primary commodity production towards export-oriented manufacturing. The Investment Incentives Act of 1968 and the FTZs Act of 1971 helped attract foreign investors through numerous and lengthy tax and import duty exemptions and incentives such as tariff protections (Jomo, 1993; Rasiah, 1993).

Table 4. Manufacturing value-added growth (% per year) in Malaysia, 1979-2010. A comparison of various sectors.

Sector	1979-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
Food	5.5	6.6	12.2	10.7	3.0	11.0
Textiles and garments	4.7	12.8	17.1	6.8	-11.5	-1.3
Rubber	4.2	25.0	13.6	7.6	-1.6	4.6
Chemical	2.8	7.9	12.5	12.0	12.3	-27.3
Basic metal	9.8	5.0	8.7	10.2	4.4	13.6
Transport equipment	9.0	15.0	17.6	6.5	4.6	10.6
Electrical machinery and electronics	8.0	16.4	26.8	12.1	0.5	1.3

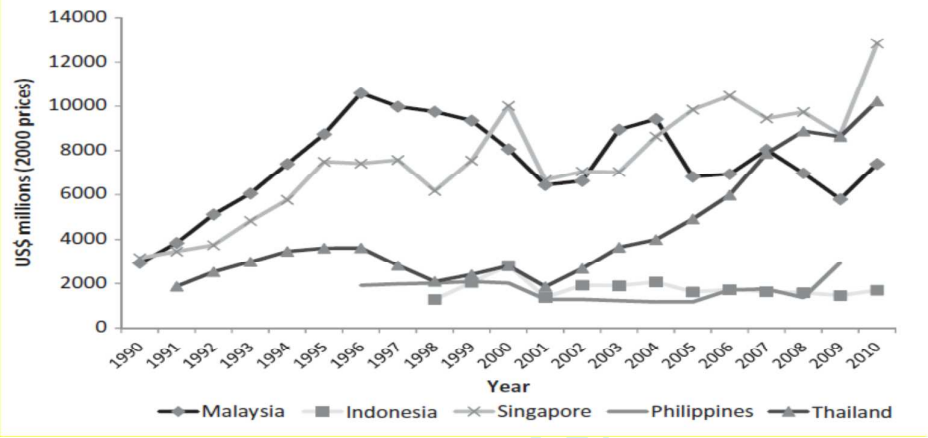
Source: Rasiah et al. (2015)

Table 5. Characteristics of the electrical machinery and electronics sector in Malaysia, 1998-2010 (%).

	1988-1990	1990-1997	2001-2005	2005-2010
Annual average growth of employment	28.61	11.36	3.79	-1.50
Annual average growth of labour productivity	4.97	11.79	-0.91	0.04
Annual average growth of real wages	1.24	4.29	1.41	1.82

Source: Rasiah et al. (2015)

Figure 1. Value-added in electronics exports, selected South-East Asian countries, 1990–2010



Source: Rasiah, et al. (2014)

The first electronic firms to locate in Malaysia were American semiconductor companies who set up subsidiary factories in the state of Penang during the late 1960s and early 1970s (Wangel, 2001). Many more foreign investors followed and by 1980 there were 25 electronic assembly factories and four 4 FTZs in Penang (Hutchinson, 2008). In the 1980s all semiconductor firms in the country were foreign MNCs and Malaysia become the largest semiconductor exporter in the world (72% of all outputs in 1985). This was an attest to the successes of its export-oriented industrialisation policies. The 1970s and 1980s was also the largest growth phase in the industry where employment rose by 16% with an average 61% annual employment growth rate for the industry between 1973 and 1985 (in comparison to 8% for the entire manufacturing sector) (Narayanan & Rasiah, 1992; O'Connor, 1993).

The first growth phase from 1970s to mid-1980s (see Figure 2) ended during the global recession of the mid-1980s. 30,000 jobs in the industry were lost between 1984 and

1986 (the national unemployment rate doubled to 7.4% in 1986) (Henderson & Phillips, 2007; Narayanan & Rasiah, 1992). However, as the global economy picked up in the late 1980s rising demand for consumer electronics in Western markets shuttled in a second growth phase with a new generation of foreign investments by Japanese, South Korean, and Taiwanese firms (Narayanan & Rasiah, 1992). This phase coincided with Malaysia's First Industrial Master Plan (for 1986 to 1995) which called for upgrading technological capabilities and skills, creating linkages between MNCs and Malaysian suppliers, and diversifying the industry into labour intensive consumer electronics. The aim was to create demand for a local support industry for components assembly. A domestic supplier base did develop which assembled commodity components such as printed circuit boards, speakers, monitors, and keyboards, and conducted plastic moulding and packaging for MNCs – activities which are low in the value-added spectrum (Ernst, 2003; Henderson & Phillips, 2007; Jomo, 1993; Narayanan & Rasiah, 1992; O'Connor, 1993). In 1990 Malaysia remained the largest world exporter of assembled semiconductors and consumer electronics (on their way to become commoditised in the industry) became the largest foreign exchange earner (Narayanan & Rasiah, 1992; O'Connor, 1993).

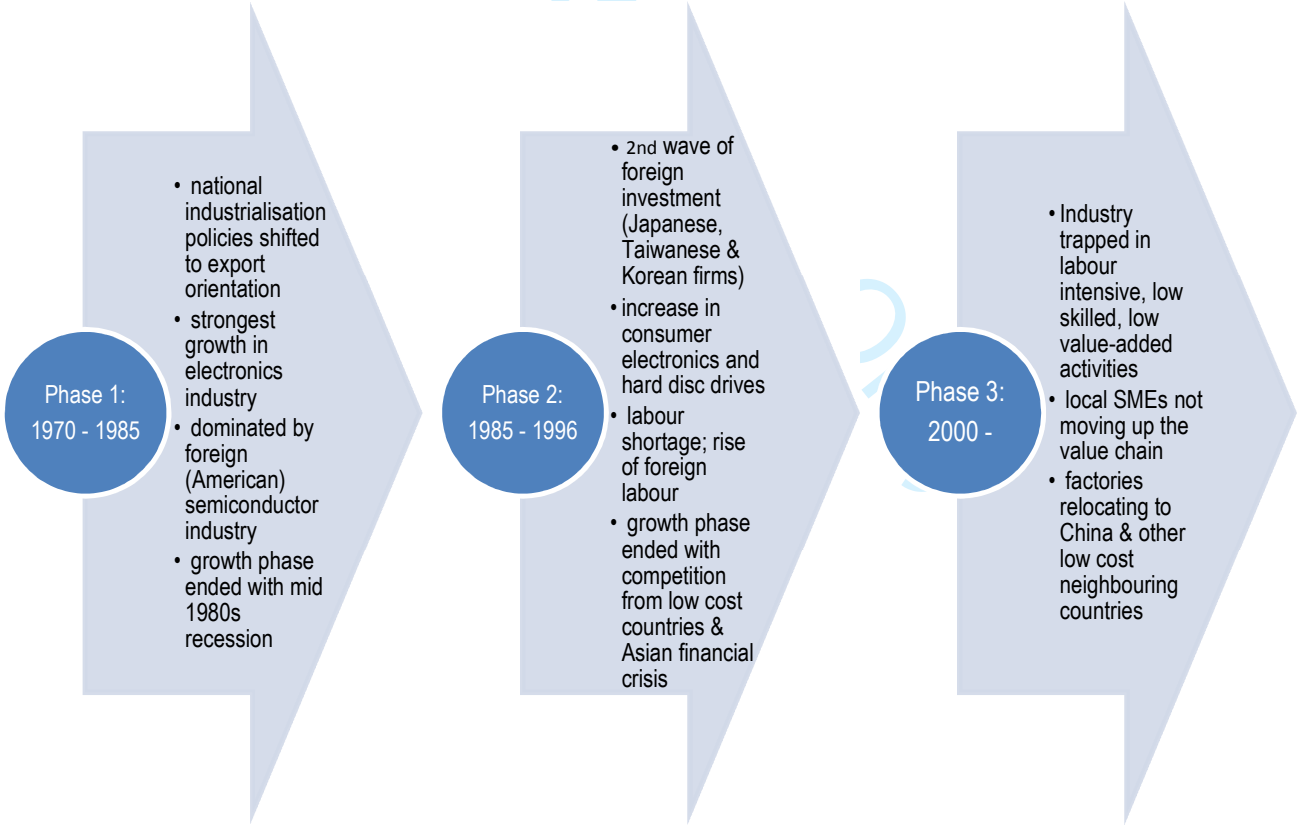
The second growth phase was so successful that a serious labour shortage emerged in the 1980s (Narayanan & Rasiah, 1992). The first stumbling block for future upgrading prospects was the policy response by the Malaysian government to the labour shortage. The government instituted policies for the inflow of low-waged and low-skilled foreign migrant workers. This was spearheaded through bilateral agreements via Memorandum of Understandings with low-waged neighbouring countries. Since the 1980s the Malaysian state has actively encouraged an influx of foreign workers to meet lower-skilled demand in the electronics industry (Rasiah et al., 2015; World Bank, 2013). The number of foreign workers into the electronics industry took-off in the early 1990s.

Today, Malaysia has the largest number of foreign workers in South-East Asia. In 2013, estimates of foreign workers were 4 million (close to half being undocumented) and made up around a quarter of all employed workers in the country (Rasiah et al., 2015; World Bank, 2013). The demographics of foreign workers are characteristically low-skilled. In 2008, 96% of foreign workers fell into the category of "unskilled" (Rasiah et al., 2015). The majority are employed as production and operation workers in low-skilled areas of the manufacturing sector including the electronics industry (Devadason & Meng, 2014; Kaur,

2015). It is said that the Malaysian government recognises that preventing an influx of low-wage low-skilled foreign workers would result in MNCs moving out to other lower-wage countries (Devadason & Meng, 2014; Edgington & Hayter, 2013; Phillips & Henderson, 2009).

A lack of upgrading is also evidenced by the persistence of low wages in the industry (Luethje et al., 2013). While wages rose in Malaysia from the 1990s onwards due to a labour shortage, since the mid-2000s wages have not increased at a faster rate. This has helped maintain Malaysia´s competitiveness with other labour-intensive locations such as China. In fact, wages in China rose at a faster pace than in Malaysia and by the end of the 2000s, wages were comparable in both production country locations (Edgington & Hayter, 2013). In 2012 average monthly salaries and wages in the manufacture of electronic components and boards were lower than many other manufacturing sectors such as petroleum, chemicals, and tobacco (see Figure 3).

Figure 2. Key phases of the electronics industry in Malaysia



In the presence of a very large low-waged workforce in the industry, sustained by government policies ensuring a continual inflow of a foreign workforce on temporary contracts, the second stumbling block was ushered in with the relocation of labour-intensive hard disc drive factories from Singapore to Malaysia during the 1990s (Ernst, 2003; Henderson & Phillips, 2007; Hiratsuka, 2011; O'Connor, 1993; Rasiah, 2006). Coinciding with a rising number of foreign workers in the industry, workers in the hard disc drive industry in the state of Penang alone grew from 2,600 in 1990 to 32,000 in 1996. By 1996, the hard disc drive assembly sector, a low-value-added activity of assembling imported inputs, employed 27% of all electronics workers in Penang (Henderson & Phillips, 2007).

Figure 3. Employment, salaries and wages by manufacturing groups, 2012

Group code	Description	Total employment	Total paid employees	Total salaries & wages (RM million)	Average salaries & wages received per month (RM)
192	Manufacture of refined petroleum products	14,401	14,401	784.3	4,539
201	Manufacture of basic chemicals, fertilizer and nitrogen compounds, plastic and synthetic rubber in primary forms	38,293	38,230	1,836.9	4,004
120	Manufacture of tobacco products	2,240	2,204	99.7	3,769
203	Manufacture of man-made fibres	623	623	27.7	3,711
264	Manufacture of consumer electronics	38,753	38,753	1,671.1	3,593
332	Installation of industrial machinery and equipment	1,357	1,331	57.0	3,569
268	Manufacture of magnetic and optical media	813	813	32.4	3,323
261	Manufacture of electronic components and boards	199,238	199,206	6,874.4	2,876
291	Manufacture of motor vehicles	33,253	33,245	1,137.9	2,852
105	Manufacture of dairy products	14,671	14,557	487.6	2,791
	Other groups*	1,654,433	1,618,948	37,311	1,921

* Other groups consist of 60 manufacturing groups

Source: Statistics Malaysia, 2014

The second growth phase ended in the late 1990s with the 1997/8 Asian Financial Crisis. Despite passing a Second Industrial Master Plan (for 1996 to 2005) with plans for upgrading within GVCs through increased R&D, productivity, and higher value-added activities (Ohno, 2009), Malaysia's low-skilled, labour intensive industry instead faced competition from newer lower cost countries such as China and Vietnam. By the late 1990s,

the short-lived hard disc drive and computer assembly sector had largely relocated to China and Thailand (Rasiah, 2005). Reduced demand for consumer electronics after the Asian Financial Crisis further weakened the industry. The response by the Malaysian government was the introduction of the third and final stumbling block -- the removal of trade-related restrictions and increased incentives for existing foreign investors, which were largely in low-value-added, labour-intensive production, to stay. This included removing the condition of foreign firms to sell to the domestic market, increasing tax incentives and exemptions, and no longer requiring conditionalities to source locally (in line with Malaysia's commitments to the World Trade Organisation) (Henderson & Phillips, 2007). With an unsuccessful and lack of a clear domestic strategy for upgrading, Malaysia maintained a low-road competitiveness strategy against newer low-cost country locations.

These three stumbling blocks created a scenario for entrapment in the lower value-added rungs of the electronics industry GVC. Since 2000 the industry has not transitioned out of low-cost, low-waged, and labour-intensive assembly operations run by large foreign MNCs (Henderson & Philips, 2007; Luethje et al., 2013). Building on this historical understanding the next section discusses how the dynamic changes in the electronics industry GVC has influenced the type of foreign firms and activities located in Malaysia.

4. Getting stuck in the lower rungs of a dynamic electronics industry GVC

Given that the main economic actors in the electronics industry in Malaysia are foreign firms which are deeply embedded in GVCs, a GVC perspective is important for understanding the challenges faced in upgrading. GVC analysis is concerned with relationships between lead firms and suppliers and how they shape the organisation of globally dispersed activities. While states can play an influential role in attracting foreign firms or developing domestic firms in certain nodes of GVCs to locate, remain, or upgrade in their countries, changes at the global structural levels of industries can determine firm strategies and (re)organisation of operations and supply chains which may not always cater to state interventions. Thus, the question becomes whether host countries can 'be ready' with the necessary domestic capabilities to benefit from opportunistic moments during restructuring processes in dynamic GVCs. This section argues that as the electronics industry GVC evolved the context of dominant MNC presence and a low-waged workforce in the country, two key factors presented obstacles to moving up the value chain in Malaysia. They

are a 1) prolonged dominance of foreign firms in dynamic GVCs towards a stronger presence of large transnational first-tier contract manufacturers, and 2) continued supply of low-waged foreign workers to cater to the choices of not upgrading in Malaysia.

4.1 Transformations in the electronics industry GVC

Since the global financial crisis of 2007/8, the electronics industry GVC has undergone major restructuring and reorganisation. Branded firms in the computer industry have responded to increasing competition, due to falling margins from the further commodification of consumer electronics such as desktop computers and laptops, by further consolidating their supplier bases and moving their own business strategies towards higher margin functions in services. Brand firms such as Dell and Hewlett-Packard (HP) have increasingly moved towards the 'IBM' model to become providers of business services such as cloud computing, servers, and storage. In its more extreme response, the brand firm HP split into two separate firms, HP Inc. and HP Enterprise, in 2015. HP Inc. gained a new CEO and retained the computer businesses and HP Enterprise became a new company serving business customers in cloud computing, servers, storage, financial services and business consulting. These changes among branded lead firms in the GVC has resulted in their increased outsourcing to contract manufacturers. In return, contract manufacturers have increased their control over GVCs.

The majority of the top five contract manufacturers, Flex, Jabil Circuit, Celestica, Sanmina-SCI, and Foxconn originated in North America (with the exception of Foxconn) assembling printed circuit boards (PCBs) for branded and other firms for the technology industry. Contract manufacturers grew in size during the 1990s as lead firms in the computer industry increased their outsourcing practices alongside with the modularisation of manufacturing process of parts and components and the assembly of final computers. Gaining trust from lead firms, the contract manufacturing industry boomed as these suppliers took on more responsibilities, including supply chain management, purchasing and inventory management, logistics, and after-sales and repair services (Raj-Reichert, 2018; Sturgeon, 2002).

Contract manufacturers have increasingly moved into higher value-added functions of design, innovation, product design and prototyping, 3-D printing for manufacturing, and

manufacturing design and technology for their customer firms. Part of their strategies include diversifying into the automotive, health, and aerospace industries (Raj-Reichert, 2018). While the majority of these higher value-added functions are based in the US, there has been some expansion of design and engineering centres into developing countries. They include China, Mexico, the Philippines, Singapore Taiwan, and Thailand. Malaysia, a host country in which many contract manufacturers began their offshore operations, is conspicuously missing from this list. The remainder of this section discusses the historical context by which three contract manufacturers, Flex, Jabil Circuit and Celestica, have chosen to locate their newer higher-value added functions in other developing country locations despite operating in Malaysia since the mid-1990s. It focuses on their prolonged dominance as foreign suppliers in Malaysia and how their evolution in the host country has been shaped and supported by an influx of low-waged foreign workers.

4.2 Flex, Jabil Circuit, and Celestica

Contract manufacturers expanded their operations into Malaysia (and Asia generally) during the 1990s. The majority of their operations are large labour-intensive factories. This is because they were in the business of providing low-cost outsourced manufacturing solutions. Originally these suppliers co-located their production facilities to be in close proximity to lead firms such as Hewlett-Packard and Dell (Philipps & Henderson, 2009; firm interviews, 2008). Their presence was dominant and well established in the GVC and Penang became known for its "world class capability" for assembly and testing of semiconductors, computer components, and computers (Rasiah, 2005).

Flex (formerly known as Flextronics) was established in California in 1969 as a PCB assembler and grew into a large contract manufacturer in the 1980s. In 2007, it acquired its competitor contract manufacturer Solectron and became the second largest contract manufacturer behind Foxconn. Flex established its first factory in Malaysia in 1991. Today (in 2018), it has 12 facilities in the country. Flex built its operations in Malaysia with a major tax incentive. It received Pioneer Status on particular products for an initial five-year period in 1993, which was renewed for another ten years. Over the years Flex continued to view Malaysia as a competitive low-cost location ideal for scaling existing and new production. Its Vice President Shammy Kan in 2010 was quoted, "Malaysia offers a very competitive environment, so we can provide scalable lower cost solutions" (Schroeter, 2010).

Before the global financial crisis of 2007/8, Malaysia was a major production location for Flex. Malaysia was second to China in consolidated net sales of over 50% at times from its operations. Following the global financial crisis, the US and Mexico along with China were the top three sites for highest amounts of consolidated net sales. The high amount for the US likely indicates higher value-added operations. By 2013, Flex's operations had reduced significantly in Malaysia which accounted for only 10% of its consolidated net sales that year. Operations in Malaysia reported a period of losses during the first half of the 2010s. By 2016 however profitability in its Malaysian operations had picked up (Flex SEC 10-K filing, 2016).

Flex has in recent years diversified into new sectors such as automotive and healthcare. Announcements for new operations and expansion within Malaysia in these new industries however continue to be low value-added and labour-intensive such as full assembly services (Emmanuel, 2015). In 2015 Flex announced plans to expand its operations in Malaysia into medical devices, solar module, and printers. This included the increased use of local supply chain content of sheet-metal and packaging material – a far cry from high value-added domestic inputs. One of its newer facilities in the state of Johor to manufacture for the healthcare industry was for the low value-added activities of PCBA, plastic injection moulding, and sub-assembly of disposable medical equipment (Flex, 2010).

Another large contract manufacturer, Jabil Circuit, was founded in Michigan in 1966. Its first offshore location to a developing country was Malaysia when it established a plant in the Bayan Lepas Free Trade Zone in Penang in 1995. After 20 years in Penang, it has a large manufacturing presence in the country. Like Flex, Jabil Circuit received a Pioneer Status tax holiday from 1995 to 2000 which was renewed for an additional ten years.

Jabil Circuit has also diversified into new sectors that include the healthcare and aerospace industries. It began manufacturing operations in these sectors in 2010 in Penang. This was made evident by the listing of standards compliance of Aerospace Standard AS/EN 9100 Medical Standard ISO-13485 (SEC 10-K company filing, 2010). In 2015, the contract manufacturer signed a RM1 Billion investment plan for a new manufacturing plant in Penang (Mok, 2015). This new site was for manufacturing products for electronics, healthcare, and the aerospace sectors (Jabil Circuit, Inc., n.d.).

Jabil Circuit lists the types of activities undertaken in its facilities in its SEC company filings. While several sites in China, such as Beijing and Shanghai, are listed as conducting design, its Malaysian sites never received such a listing.[v] Its Malaysian operations reported in 2017 were for "manufacturing, support, storage" (SEC 10-K filing, 2017). This indicates that the automotive and medical engagements are likely to have also been in lower value-added segments of the production process.

In the late 1990s, expanded heavily into China which has in recent years surpassed its presence in Malaysia. In 2017 Jabil Circuit reported its combined facilities in Malaysia totalling 1,360,000 sq feet. In China (its largest operations) was 21, 955,000 sq feet in 2017. Signalling a reduction in its relative presence, Malaysia fell into the fourth largest production location with the second largest being the US and the third Mexico in 2017.

The smaller contract manufacturer Celestica was originally a manufacturing arm of IBM Canada and became an independent firm in 1994. It also received Pioneer Status from 2010 to 2014 with continuing negotiations to date for a renewal (SEC 20-F filing, 2016). Celestica has also diversified into the aerospace industry and began manufacturing activities in Penang in 2013. The products being manufactured are displays and computers for the cockpit and cabin in-flight entertainment systems for Airbus (Rafale for Malaysia, n.d.). These are relatively low value-added and labour-intensive processes in the production of aeroplanes.

In 2012, Celestica lost a major contract from Blackberry which forced it into a major restructuring. Malaysia was one of the locations to be affected with employee terminations. Celestica as part of its strategies to rebuild and move into higher margin functions moved into joint design manufacturing with customer firms. An example is the design of cloud servers. Some of this new design activities have been offshored to Shanghai, China where it has a 300-member design team (see Table 6) (Daly, 2015). Malaysia was not on the receiving end for design centres.

This brief discussion provides a general indication of the type of production location Malaysia is for contract manufacturers in the electronics industry. As these suppliers upgrade into more-higher value-added functions, in particular design and engineering, they have chosen to locate those activities in China as the preferred developing country as opposed to

Malaysia. This despite their longer presence in the latter. This points to a lack of skills, in particular engineers, in Malaysia and its inability to compete with a country like China.

The use of foreign workers is widespread in the electronics industry in Malaysia. In 2013, the electronics industry was the second largest employer of foreign workers in the country (Narayanan & Lai, 2014). There is also a preference by large foreign firms, which have large operations, towards foreign workers. During the early 2000s Japanese firms in Malaysia were found with up to 40% of the workforce made up of foreign workers (Edgington & Hayter, 2013). More recently, it is estimated that 20 to 60 percent of the total workforce in the electronics industry in Malaysia is made up of foreign workers (Simpson, 2013b). The top sending countries are Indonesia and Nepal (Simpson, 2013b; Simpson, 2013a) followed by Bangladesh, Myanmar, Sri Lanka, Cambodia, and Vietnam (personal communications in Penang, Malaysia, 2008 and 2015; Bormann, Krishnan, & Neuner, 2010).

Lacking official statistics on foreign workers in the country, interviews with different respondents nevertheless shows a link between the influx of low-waged and low-skilled foreign workers and the ongoing operations of contract manufacturers in lower value-added activities in Malaysia. The link between the rise of contract manufacturing in Malaysia and the rise of foreign workers in the 1990s was made by Phillips and Henderson (2009). According to the authors, contract manufacturers had lobbied the Malaysian government to allow for a greater influx of foreign workers. The successful intervention is shown by the dramatic rise in the number of foreign workers in the electronics industry which grew from 1,024 in 1990 to 46,470 in 1996 (Phillips & Henderson, 2009).

I now turn to a set of interviews with three contract manufacturers which point to decisions made in the restructuring of the GVC which resulted in maintaining Malaysia as a preferred location for low value-added activities.

Interviews with various managers revealed a clear acknowledgment of the labour-intensive assembly niche, in particular PCBA activities, Malaysia occupies in the GVC. CB1, a large contract manufacturer in Penang engaged in PCBA, spoke about the clear preference for Penang as a site for contract manufacturers. “Contract manufacturers will stay in Penang because there is three generations of workers in the industry already” (CB1-M2, 2015). CB1-M2, who has been in the company over ten years, detailed the evolution of the contract

manufacturing industry in Penang and Malaysia in relation to changes in costs and wages. The manager noted,

> "At first companies thought to move to China but wages are going up and there are intellectual property problems. The next location was Vietnam but it does not have the infrastructure. But Malaysia still has stable politics. There are also Singaporean companies moving to the mainland [Malaysia] because Singapore is getting too expensive" (2015).

Another large contract manufacturer, CB2 with two large plants in FTZs in Penang, which employed 6,000 workers in 2015, reported the majority of the business (30% to 40%) in PCBA. Indicating a trend of downgrading, the South Asia Regional Human Resources (CB2-M1) manager noted,

> "Penang began as a semiconductor place and moved to wafer fab and is now for contract manufacturing. Penang used to be known as the semiconductor Silicon Valley. Now it is known as the "contract manufacturing Silicon Valley" (2015).

Comparing costs with its competitor China, CB2-M1 felt "China is also more expensive when it comes to their labor costs and taxes; whereas Malaysia provides tax exemption."

The concerted efforts and provisions made by the Malaysian government in its early years of attracting foreign firms still feature as part of the reasons to continue existing operations. A VP at CB1 finds that wages and costs are not the only reasons for where they locate their factories,

> "The infrastructure question in new locations like Vietnam is poor. CB1 also needs suppliers and vendors near-by. It takes time to establish these, especially in the tech-sector. We're in Malaysia because the government made concerted effort to attract companies. Some customers want us to be in Malaysia and not China."

However, these attractive features have maintained Malaysia as an attractive labour intensive and low-wage location. It was clear that low-wages and foreign workers were a favourable factor for operations in the country.

CB2 relied heavily on foreign workers, which made up 60% of the workforce. Recruited through labour agencies a single foreign worker could cost CB2 between USD

$1,000 to USD $3,000 (per head) depending on the country of origin. The cost of foreign worker recruitment (immigration and agency fees) was around 1 Million Malaysian Ringgit (around USD$ 286,000 in January 2015) per batch of workers on 2-year contracts. Work permit renewals were 380 Ringgit (around USD $109 in January 2015). However, CB2-M1 felt the cost of labour was marginal for the site because they made up only around 5-10% of the operating costs (80% of costs were material).

CB1 also relied heavily on foreign workers. According to CB1-M1, the Human Resources Director for the Southeast Region, 40% of the workforce at the plant were foreign workers. The majority were from Myanmar, Nepal, Indonesia, Sri Lanka, Bangladesh, and India. There were also higher skilled foreign workers such as engineers from the Philippines and India. The need for foreign workers was said to be due to the "challenge of hiring local workers because other sectors pay more… it is difficult to reduce the number of foreign workers because of the "nature of the business". Put more directly, CB1-M2 (a Health and Safety Director) explained, "Malaysians don't want to work in the factories because they don't want to stand for 2 hours in factories" (2015).

There were also several advantages presented for the use of foreign workers, one of them being their 'dedication'. A manager at the global headquarters of CB2 (CB2-GM) described the reasons for foreign workers in Malaysia as their ability to do over-time in contrast to local workers. General managers at the Malaysian factories found it difficult to schedule weekend shifts because the 'native Malays' would not always show up. In the case of foreign workers, however,

> "they do not have sick children to take care of at home or go to doctor's appointment. They're here [in Malaysia] to work. Malay natives are not as efficient and are unreliable. They are more into a work life-balance and will go home to their families." (CB2-GM, 2016).

This honest response on working conditions reflects the inability of foreign workers to switch employers or leave the country before the end of their job contracts. This sentiment was also revealed in a survey of 101 companies (19% from the electrical/electronics industry) conducted by the Malaysian Employers Federation in 2014 where Kaur (2015) found firms preferred foreign workers because they are more easily exploited to work over-time and accept poor working and living conditions.

At its extremes, the severity of the lack of freedoms amongst foreign workers in Malaysia came to light in a September 2014 report which found a high incidence of forced labour amongst foreign workers in the electronics industry in Malaysia (Verite, 2014).

The role of the Malaysian government in the influx of foreign workers were similarly pointed. CB2-M1 noted, "the Malaysian government won't reduce the foreign workers because it would affect manufacturing which makes up 20% to 30% of GDP in the country." When asked how the Malaysian government plans to move up the value chain while depending heavily on foreign low-waged workers, CB2-M1 was skeptical,

> "Malaysia is on "auto pilot". Yes that is the term they use here. The government is distracted. They are distracted with other things [in reference to political crises such as the guilty verdict on the day of the interview of the political opposition leader Anwar Ibrahim who was subsequently imprisoned]. The moving up the value chain will be private sector driven." (2015).

This sentiment was echoed by a Singaporean manager where the regional headquarters was located and who was a Corporate Manager heading the Asia-Pacific region,

> "In Malaysia, they want to be a manufacturing hub, which is labour intensive. Because there are not enough locals to do the jobs, the Malaysian government has brought in foreign workers. Singapore was the same in the 1970s and 1980s, when there was more manufacturing taking place. Also, in the 1990s, when I first started working it was for Philips, Malaysian workers were bused in during the morning and bused back in the evenings. The situation changed in the 2000s due to economic policy. I did not think the changes were due to a rise in wages but the opening up of China. MNCs still cared about the costs and so shipped factories to China. MNCs also wanted the China market, which has over 1 billion consumers. So the Singapore government moved more towards R&D after losing factories to China." *Q: How did the government incentivize the industry?* "Through training, which the government subsidized." (2015).

Table 6. Contract manufacturer design locations in developing countries

Jabil Circuit: Design engineering services	Flex: Design and engineering services	Celestica: Design

Beijing, Shanghai (China)	Hong Kong, Pudong, Zhuhai (China)	Shanghai (China)
Hsinchu, Taichung (Taiwan)	Cebu, Manila (Philippines)	Laem Chabang (Thailand)
	Kallang (Singapore)	
	Taipei (Taiwan)	
	Guadalajara, Juarez (Mexico)	
	Sorocaba (Brazil)	

Source: Company websites, SEC 10-K filings, and SEC 20-F filings

4.3 Contract manufacturers, low-waged foreign workers, and the lack of upgrading

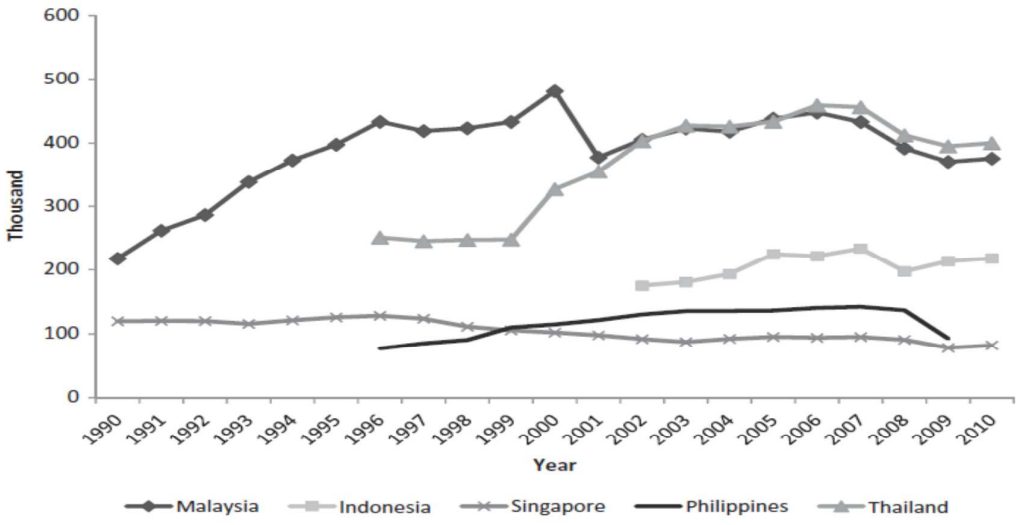
În Malaysia, contract manufacturers have shown an interest in maintaining the large factories they have built decades ago to continue the mass manufacturing activities in a stable low-cost location with infrastructure. However, excessive reliance on foreign low-skilled workers, which artificially maintained low wages in the electronics industry, helped sustain Malaysia's low-value-added position within the GVC – this despite a critical period where competition with other low-cost countries in the East Asia region after the Asian Financial Crisis in 1997 (Edgington & Hayter, 2014) could have been used as a push towards upgrading policies. Indeed, the recovered growth in employment in the electronics industry shortly after the financial crisis in 1999 was in step with an influx of low-waged foreign workers. More specifically while competition with the then lower-cost China, during the 1990s, could have been an opportunity for Malaysia to take the high road and upgrade, it was largely unable to do so due to various pull and push factors. This is made evident by Malaysia being surpassed by China and elsewhere as the preferred locations to host design and engineering activities by contract manufacturers. The continuing labour-intensive nature of the electronics industry in Malaysia is seen with its rate of employment growth apace with Thailand (a lower cost country competitor in the region).

The situation in Malaysia is is in stark contrast to neighbouring Singapore - an example of a success story of upgrading in the industry (see Figure 4) (Rasiah, Yap, & Chandran et al., 2014). Indeed, Singapore was more effective with its policies and approaches for building higher skills and establishing R&D centres in cooperation with academia and the private sector including MNCs, which moved its electronics industry up the value chain into high-end manufacturing such as semiconductors production and R&D (Rasiah, 2006).

Employment in the industry has become less labour-intensive and actual figures of workers have fallen as a result of higher costs of production in the country (see Figure 1) (Rasiah et al., 2014).

This discussion has shown that the dominance of foreign firms alone and their upgrading trajectories and inter-firm relationships within the GVC is not the ultimate detriment to moving up the value chain. Rather, policies and incentives which drive certain types of foreign firms (in this case contract manufacturers) to stay and the type of activities they choose to locate in different geographical locations matters in prolonging environments only suitable for low value-added manufacturing that misses out on or prevents the ability to leverage opportunities for upgrading. As noted by Athukorala and Menon (1999), policies which restrict foreign worker inflows and the discouragement of labour-intensive production would lead to upgrading however only if there is a simultaneous increase in the skill levels of the domestic workforce in Malaysia.

Figure 4. Employment in the electronics industry, selected South-East Asian countries, 1990–2010



Source: Rasiah, et al. Yap, and Chandran, (2014).

5. Conclusion

There are two key arguments made in this paper for the reasons behind the inability of the electronics industry in Malaysia to upgrade. As the strongest manufacturing sector in the country, the situation is indicative of the wider challenges Malaysia faces with overcoming the middle-income trap and the current state of negative industrialisation in the country.

Using a GVC perspective, the paper argues that a prolonged dominance of foreign firms, in particular contract manufacturers, and policies favouring an excessive influx of low-waged foreign workers, as part of the country's deep integration in a dynamic GVC, has contributed to its inability to upgrade out of labour-intensive manufacturing in the lower rungs of the value chain. Specifically, the paper showed how restructuring dynamics in the electronics industry GVC has increased the role and powers of contract manufacturers. Because contract manufacturers are large employers with very large factories in developing countries, their geographical decisions and strategies pertaining to their lower and higher value-added activities (as part of GVC restructuring and reorganisation) can influence upgrading prospects in host countries whose electronics industres are dominated by these suppliers. This is particularly important as contract manufacturers increasingly move into design and innovation functions and decide where in the global South to cost-effectively locate these new operations. For Malaysia, despite being present since the mid-1990s, contract manufacturers have chosen to locate design and engineering centres in other developing countries such as China and Taiwan. Malaysia's inability to catch onto upgrading trajectories in GVCs was supported by the artificial maintenance of a low-skilled, low-waged workforce through the use of foreign workers.

An implication of the findings and arguments made in the paper is on the risks government policies that maintain a low-road, low-cost (perceived) competitive advantage in GVCs for too long can result in foregoing and being bypassed for upgrading opportunities. As contract manufacturers continue to expand their operations in new geographical locations (as branded firms increasingly outsource more and more of their production to this group of suppliers), and as new low-cost countries such as Vietnam, Indonesia, Thailand, and Cambodia, are competing to become the next generation of production locations for the electronics industry, government incentives and policies should take heed of the traps that can be built within lower rungs of GVCs as low-cost manufacturing locations. Policies which lead to entrapment in low value-added functions in wider GVC-linked national industrialisation strategies, can be harbingers and representative of wider risks that may lead to middle-income traps.

REFERENCES

1. Athukorala, P.-C., & Menon, J. (1999). Outward orientation and economic development in Malaysia. *World Economy, 22*(8), 1119-1139.
2. Azmeh, S., Nadvi, K., & Raj-Reichert, G. (2014, June). *Who is running the show in global value chains? Rethinking the role of trans-national first-tier suppliers in the garments and electronics industry*. Paper presented at the 27th Society for the Advancement of Socio-Economics, London, United Kingdom.
3. Barrientos, S., Gereffi, G., & Rossi, A. (2011). Economic and social upgrading in global production networks: A new paradigm for a changing world. *International Labour Review*, *150*(3−4), 319−340.
4. Bormann, S., Krishnan, P., & Neuner, M. E. (2010). *Migration in a digital age. Migrant workers in the Malaysian electronics industry: Case studies on Jabil Circuit and Flex*. Berlin: World Economy, Ecology and Development.
5. Carillo, J., & Zarate, R. (2009). The evolution of maquiladora best practices: 1965−2008. *Journal of Business Ethics, 88*, 335−348.
6. Daly, J. (2015, 26 June). Ten Canadian firms search for overseas success. *The Globe and Mail*. Retrieved from http://www.theglobeandmail.com/report-on-business/rob-magazine/top-1000/ten-canadian-firms-in-search-of-overseas-success/article25078712/
7. Devadason, E. S., & Meng, C. W. (2014). Policies and laws regulating migrant workers in Malaysia: A critical appraisal. *Journal of Contemporary Asia, 44*(1), 19-35.
8. Doner, R. F. & Schneider, B. R. (2016). The middle-income trap: more politics than economics. *World Politics, 4*, 608-44.
9. Edgington, D. & Hayter, R. (2013). The in situ upgrading of Japanese electronics firms in Malaysian industrial clusters. *Economic Geography, 89,* 227-259.
10. Emmanuel, M. (2015, 4 August). Flex set to expand investment footprint, *NST Business Time*. Retrieved from http://www.mida.gov.my/home/2657/news/flex-set-to-expand-investment-footprint/#
11. Ernst, D. (2003). *How sustainable are benefits from global production networks? Malaysia's upgrading prospects in the electronics industry,* (East-West Center Working Papers). Hawaii.

12. European Commission (2012). *ICT sector guide on implementing the UN Guiding Principles on Business and Human Rights.* Brussels: European Commission.
13. Felipe, J. (2012). *Tracking the Middle-Income Trap: What is it, who is it, and why?* (Asian Development Bank Economics Working Paper Series). Manila: Philippines.
14. Flex (2010, 1 November). Flex Medical to Open Malaysia Facility to Complement Existing Low-Cost Footprint and Support Growth for Manufacturing Services, Retrieved from http://investors.Flex.com/investor-relations/company-news/press-release-details/2010/Flex-Medical-to-Open-Malaysia-Facility-to-Complement-Existing-Low-Cost-Footprint-and-Support-Growth-for-Manufacturing-Services/default.aspx
15. Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains", in *Review of International Political Economy, 12*(1), 78−104.
16. Henderson, J. & Phillips, R. (2007). Unintended consequences: Social policy, state institutions and the 'stalling' of the Malaysian industrialisation project. *Economy and Society, 35*(1), 78-102.
17. Hill, H., Yean, T. S., & Zin, R. H. M. (2012). Malaysia: A success story stuck in the middle?. *The World Economy, 35*(12), 1687-1711.
18. Hiratsuka, D. (2011). *Production networks in Asia: A case study from the hard disk drive industry* (Asian Development Bank Institute Working Paper Series No. 301). Tokyo: Japan.
19. Humphrey, J. & Schmitz, H. (2002). How does insertion in global value chains affectupgrading in industrial clusters?. *Regional Studies, 36*(9), 1017−1027.
20. Hutchinson, F. E. (2008). "Developmental" States and Economic Growth at the Sub-National Level: The Case of Penang. *Southeast Asian Affairs*, 2008, 223-244
21. Jabil Circuit, Inc. (n.d.). Jabil to Expand Operations in Penang, Malaysia", Notes from Annual Shareholder Meeting. Retrieved from https://www.jabil.com/news/jabil-to-expand-operations-in-penang--malaysia.html
22. Jomo, K. S. (1993). Introduction. In K. S. Jomo (Ed.) ,*Industrialising Malaysia: Policy, Performance, Prospects* (pp. 1-13). New York, NY: Routledge..
23. Kaur, A. (2015). Labour In Malaysia: Flexibility, Policymaking And Regulated Borders. In M.L. Weiss (Ed), *Routledge handbook of contemporary Malaysia* (pp. 214-225). New York, NY: Routledge.

24. Luethje, B., Huertgen, S., Pawlicki, P., & Sproll, M. (2013). *From Silicon Valley to Shenzhen: Global production and work in the IT industry.* Lanham: Rowan & Littlefield.
25. Malaysian Investment Development Authority (2016). Electrical and Electronic Industry Overview, Retrieved from http://www.mida.gov.my/home/electrical-and-electronic/posts/
26. Mok, O. (2015, 14 May). 'RM1b re-investment with MNC will create 2,500 jobs, Penang CM says', *TheMalayMailOnline*. Retrieved from http://www.themalaymailonline.com/money/article/rm1b-re-investment-with-mnc-will-create-2500-jobs-penang-cm-says#sthash.t3US6WDV.dpuf
27. Nadvi, K. & Raj-Reichert, G. (2015). Governing health and safety at lower tiers of the computer industry global value chain. *Regulation and Governance, 9,* 243-258.
28. Narayanan, S. & Lai, Y.-W. (2014). Immigrant labor and industrial upgrading in Malaysia, *Asian and Pacific Migration Journal, 23*(3), 273-297.
29. Narayanan, S. & Rasiah, R. (1992). Malaysian electronics: The changing prospects for employment and restructuring. *Development and Change, 23*(4), 75-99.
30. O'Connor, D. (1993). Electronics and industrialisation: Approaching the 21st centre. In K. S. Jomo (Ed.), *Industrialising Malaysia: Policy, Performance, Prospects* (pp. 210-233). New York, NY: Routledge.
31. Ohno, K. (2009). Avoiding the Middle-Income Trap: Renovating industrial policy formulation in Vietnam, *ASEAN Economic Bulletin*, *26*(1), 25-43.
32. Paus, E. (2012). Confronting the middle-income trap: Insights from small latecomers. *Studies in Comparative International Development, 47,* 115-138.
33. Philips, R. & Henderson, J. (2009). Global production networks and industrial upgrading: negative lessons from Malaysian electronics. *Journal fuer Entwicklungspolitik, 25*(2), 38-61.
34. Pietrobelli, C. & Rabellotti, R. (2011). Global value chains meet innovation systems: Are there learning opportunities for developing countries?. *World Development*, *39*(7), 1261-1269.
35. Plank, L. & Staritz, C. (2013). "*Precarious upgrading" in electronics global production networks in Central and Eastern Europe: The cases of Hungary and Romania* (University of Manchester Capturing the Gains Working Paper 31). Manchester, United Kingdom.

36. Rafale for Malaysia (n.d.). *Example of industrial cooperation: Electronics Manufacturing.* Rafale for Malaysia. Retrieved from http://rafalemalaysia.com/the-cooperation/example-of-industrial-cooperation-electronics-manufacturing/
37. Raj-Reichert, G. (2018). The Changing Landscape of Contract Manufacturing in the Electronics Industry Global Value Chain. In Nathan, D., Tewari, M., & Sarkar, S. (Eds.), *Development with Global Value Chains: Upgrading and Innovation in Asia,* (in press):Cambridge University Press.
38. Raj-Reichert, G. (2015). Exercising power over labour governance in the electronics industry. *Geoforum, 67*, 80-92.
39. Rasiah, R. (1993). Free trade zones and industrial development in Malaysia. In K. S. Jomo (Ed.), *Industrialising Malaysia: Policy, Performance, Prospects* (pp. 118-146). New York, NY: Routledge.
40. Rasiah, R. (2005). China's potential impact on electronics workers in Southeast Asia, *Dialogue + Cooperation, 2*(5), 47-68.
41. Rasiah, R. (2006). Electronics in Malaysia: Export Expansion but Slow Technical Change. In V. Chandra (Ed.), *Technology, adaptation, and exports: How some developing countries got it right* (pp. 127-162). Washington, DC: World Bank Publications.
42. Rasiah, R. (2011). Is Malaysia facing negative deindustrialization?. *Pacific Affairs, 84*(4), 715-736.
43. Rasiah, R., Crinis, V., & Lee, H.-A. (2015). Industrialization and labour in Malaysia, *Journal of the Asia Pacific Economy, 20*(1) 77-99.
44. Rasiah, R., Yap, X.-S., & Chandran, G. (2014). Crisis effects on the electronics industry in Southeast Asia. *Journal of Contemporary Asia, 44*(4), 645−663.
45. Schroeter, A (2010, 16 June). Flex to push into CleanTech. *evertiq.com.*, Retrieved from http://evertiq.com/news/17175..
46. Simpson, C. (2013a, 8 November) An iPhone tester caught in Apple's supply chain. *Bloomberg News.* Retrieved from http://www.bloomberg.com/bw/articles/2013-11-07/an-iphone-tester-caught-in-apples-supply-chain#p1
47. Simpson, C. (2013b, 1 December). Workers for Plexus Corp. of Neenah paid some of the highest fees found. *Bloomberg News.* Retrieved from http://archive.jsonline.com/business/migrant-workers-pay-to-get-jobs-making-electronics-b99151857z1-234004661.html

48. Spence, M. (2011). *The Next Convergence: The Future of Economic Growth in a Multispeed World.* New York, NY: Farrar, Straus and Giroux.
49. Staritz, C., Gereffi, G., & Cattaneo, O. (2011). Editorial for Special Issue: Shifting end markets and upgrading prospects in global value chains. *International Journal of Technological Learning, Innovation and Development, 4*(1-3), 1-13.
50. Statistics Malaysia (2008-2009, 2012). *Report on the Annual Survey of Manufacturing Industries.* Kuala Lumpur: Statistics Malaysia.
51. Sturgeon, T. (2002). Modular production networks: A new American model of industrial organisation. *Industrial and Corporate Change*, *11*(3), 451-496.
52. Sturgeon, T. & Kawakami, M. (2011). Global value chains in the electronics industry: Characteristics, crisis, and upgrading opportunities for firms from developing countries. *International Journal of Technological Learning, Innovation and Development*, *4*(1−3), 120−147.
53. Verité (2014). 'Forced labor in the production of electronic goods in Malaysia: A comprehensive study of scope and characteristics'. Amherst, MA: Verité.
54. Wangel, A. (2001). *Manufacturing growth with social deficits: Environmental and labour issues in the high tech industry of Penang, Malaysia.* Annual Report. Berkeley, CA: California Global Corporate Accountability Project.
55. World Bank (2013). *Immigration in Malaysia: Assessment of its economic effects, and a review of the policy and system* (*Report completed in collaboration with ILMIA-Ministry of Human Resources of Malaysia).* Washington, DC: World Bank.

---

i Flex was formerly known as Flextronics.
ii Flex was founded in California, United States and re-incoporated in Singapore in 1990.
iii The industry is categorised as 'electrical and electronic' in Malaysian government statistics.
iv Categorised as 'Manufacture of electronic components and boards'
v In its 2004 SEC 10-K filing, there was the listing of a site in Penang undertaking design. This was however removed in the 2005 SEC 10-K filing.